North Cascades Resource Brief

National Park Service
U.S. Department of the Interior

North Cascades
National Park Complex

TOP: Douglas-fir trees return to open areas naturally after a fire. Photo by John Chao

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Fire Effects Monitoring

Fire effects monitoring is an integral part of fire management, where it is used to provide feedback to fire and resource managers on the effectiveness of fire and fuels treatments, thereby guiding fuels projects towards desirable outcomes and alerting managers to unwanted side-effects.

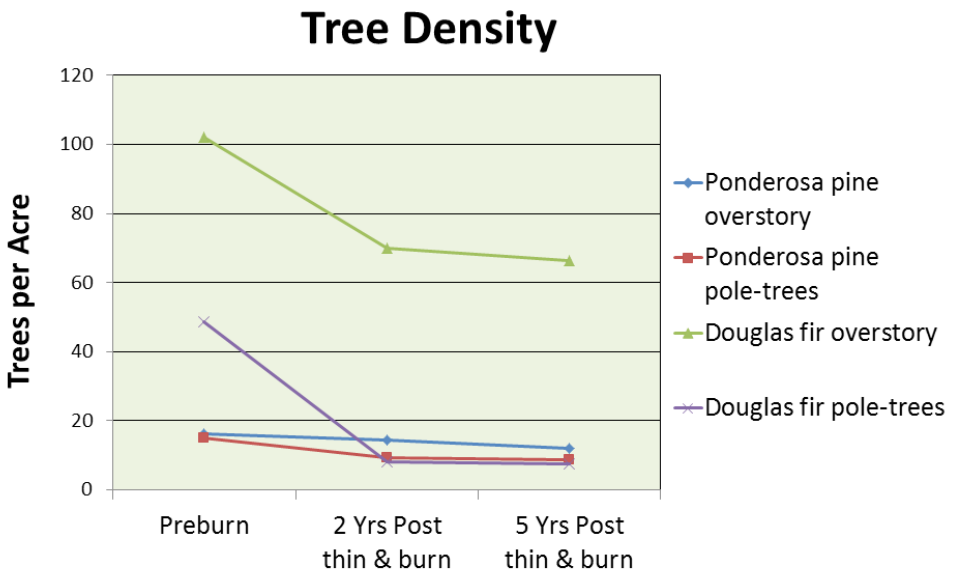
The North Pacific / Columbia Basin (NPCB) Fire Effects monitoring crew is a network-wide resource based out of North Cascades National Park. The team supports fire management activities by monitoring the effects of prescribed fires and thinning projects with respect to ecological and fuel management objectives. The crew also uses rapid assessment techniques to install and read plots during wildfires, and to measure post-burn effects and ground-truth fire severity maps after fires. Annual reports are produced each year for park staff and the national program, and every fifth year the data is presented to a peer review committee to evaluate the long-term progress of the fire management program.

Status and Trends

Fire effects monitors install permanent plots in which they record data on tree characteristics, shrub and herbaceous cover, and fuel loadings before and after thinning treatments and prescribed fires (fig. 1). They also collect data on fire behavior during the burns. The plot protocols are based on NPS-wide standards for fire effects monitoring as described in the fire monitoring handbook (USDI, 2003). Most of the fire effects monitoring plots are in the forest fuel reduction areas (FFRAs) that protect the Stehekin community, although the team has also installed plots throughout the contours of the valley in preparation for additional fire treatments. Twelve of the contour plots burned in the 2010 Rainbow Bridge Fire and were read the summer of 2011, giving us a comparison between fire effects on wildfires and prescribed fires. Fire effects measurements are tied to resource objectives, such as reducing the number of trees per acre (tree density) to mitigate fire spread through the canopy.

The thin and burn treatments target the removal of Douglas-fir trees that outcompete the less shade-tolerant ponderosa pine, thus enhancing lower severity fire regime characteristics. Although Douglas-fir trees of all size-classes are targeted, the primary objective is to reduce smaller diameter trees (pole trees). Forest stands continue to change for several years following burning due to latent mortality from the fire and secondary impacts, such as mountain pine beetle attacks. Thinning and burning resulted in a 44% reduction of all trees by the second year post-treatment, and an additional 3.9% reduction by the fifth year post-treatment.

Although the FFRAs are always thinned and burned now, this hasn't always been the case. In fact, it was the monitoring plots that illustrated that burning without thinning was resulting in the loss of too many of the remaining ponderosa pine trees, and not killing enough of the Douglas-fir trees (Kopper & Drake, 2002). These findings were the impetus for fire managers to revise the FFRA prescription so that thinning is always performed before burning in order to have more control of the treatments' outcomes. Thinning is now used whenever and wherever it is needed in the



LEFT: Fire effects monitor samples a fuels transect for downed woody debris
RIGHT: Graph showing the transition to healthier stand density as a result of controlled burns and thinning

FFRAs and prescribed burns are primarily used to reduce dead and downed fuels and stimulate the growth of native herbaceous vegetation.

There are several other important fire effects measurements that are reported. The tonnage of dead and downed woody fuels is a valuable measure of fire hazard, especially the amount of smaller diameter twigs and branches (fine woody fuels) that ignite easily and enable fire spread. Additionally, monitoring the cover and composition of the herbaceous understory helps identify potential increases in non-native species, track sensitive species, and measure the increase in grasses and forbs in response to forest openings resulting from the treatments.

Discussion

The fire effects monitoring plots serve as a record of pre-treatment forest conditions, and highlight differences between various treatments. Fire effects monitoring is used to guide fire managers to find the most effective ways to meet management goals using different techniques, and helps them to keep pace with changes in vegetation and fuel loading over the long term. Fire effects monitoring can alert managers to unwanted treatment effects, such as the mortality of non-targeted species or the introduction of invasive species; either of which would likely trigger adaptive management strategies. The data can also serve as a benchmark from which to measure ecosystem changes in the future due to climate change or other stressors. It is an appropriate tool for identifying problems and trends which can then be explored through further research.

Although monitoring is usually a precursor to research, there are times that the fire effects monitoring data is used directly in research. The fire effects monitoring data is particularly useful due to the fact that standardized protocols are used throughout the National Park Service, enabling datasets to be combined and contrasted in a statistically robust manner. The North Cascades data is used at the regional and national level by agency and university researchers to compare various treatments across multiple parks, to contribute to fuel mapping efforts, and to populate fire models. The plots will continue to increase in their utility as more treatments are accomplished and more plots are read. Not only does fire effects monitoring help fire managers reach fire and fuel management objectives, but the data (measured regularly and consistently) can also reveal long term variations in vegetation structure and inform on broad scale questions about fire in relation to climate change.

References:

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